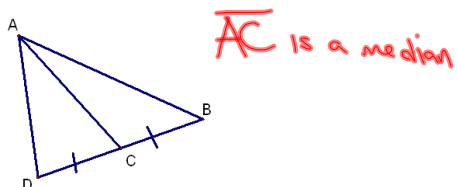
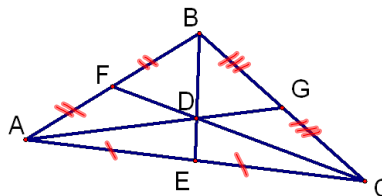


5.4 Use Medians and Altitudes

Median—is a segment whose endpoints are the vertex of a triangle and the midpoint of the side opposite the vertex.

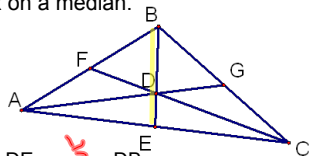


Centroid—The point of concurrency of the three medians of a triangle.



Thm 5.8 The Centroid Theorem—The centroid of a triangle is located two-thirds of the distance from a vertex to the midpoint of the side opposite the vertex on a median.

Conclusion:



$$DB = \frac{2}{3} BE \quad DE = \frac{1}{3} BE \quad DE = \frac{1}{2} DB$$

$$DA = \frac{2}{3} AG \quad DG = \frac{1}{3} AG \quad DG = \frac{1}{2} AD$$

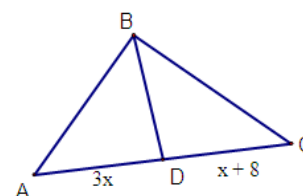
$$CD = \frac{2}{3} CF \quad FD = \frac{1}{3} CF \quad FD = \frac{1}{2} CD$$

Examples:

1. \overline{BD} is a median in $\triangle ABC$. Solve for x. _____

$$3x = x + 8$$

$$x = 4$$



2. G is the centroid.

$$AG = 7.4$$

$$AD = 6a$$

$$a = \underline{1.85}$$

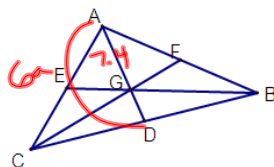
$$GE = 5c$$

$$EB = 22.8$$

$$c = \underline{1.52}$$

$$\frac{1}{3} \cdot 22.8 = 5c$$

$$1.52 = c$$



$$7.4 = \frac{2}{3}6a$$

$$7.4 = 4a$$

$$1.85 = a$$

3. Find the midpoints of the three sides of $\triangle FEG$.

Sketch the medians. Label the centroid P.

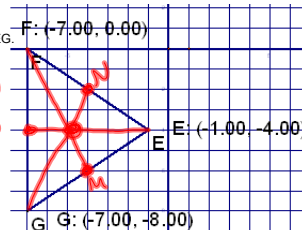
What are the coordinates for P?

Focus on horizontal/vert. medians

$$EO = 6$$

$$\frac{2}{3}6 = 4$$

4 units away from E
 $(-5, -4)$

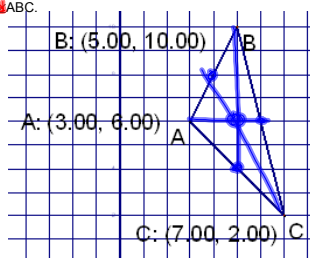


\overline{EG} M(-4, -6)
 \overline{EF} N(-4, -2)
 \overline{FG} O(-7, -4)

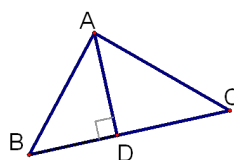
4. Find the midpoints of the three sides of $\triangle ABC$.

Sketch the medians. Label the centroid P.

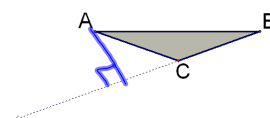
What are the coordinates for P?



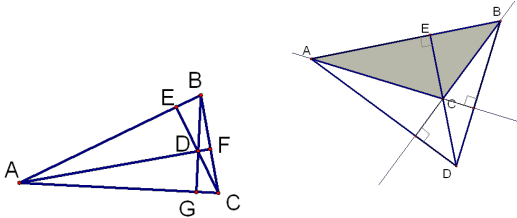
Altitude—of a triangle is a perpendicular segment from a vertex to the line containing the opposite side.



The altitude from A to \overline{BC} is on the outside of this triangle.



Orthocenter—is the point of concurrency of the three altitudes of a triangle.



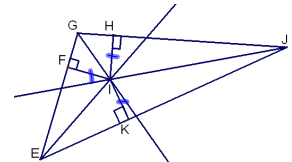
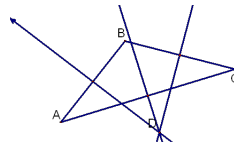
Summary

The circumcenter. (3 ⊥ bis.)

$$\overline{DA} \cong \overline{DC} \cong \overline{DB}$$

The incenter. (3 ∠ bis.)

$$\overline{IF} \cong \overline{IH} \cong \overline{IK}$$

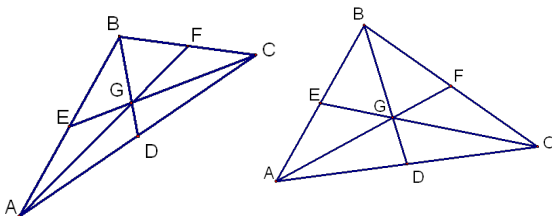


The Centroid (3 medians)

$$\overline{BG} = \frac{2}{3} \overline{BD}$$

$$\overline{GD} = \frac{1}{3} \overline{BD}$$

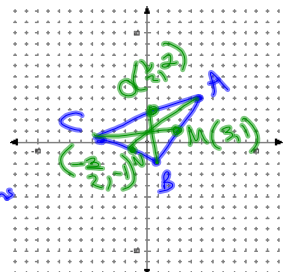
$$\overline{GD} = \frac{1}{2} \overline{BG}$$



Challenge: Find the coordinates of the centroid of triangle ABC
A(5, 4) B(1, -2) C(-4, 0)

similar to ex 3 & 4
no hardest median

* Find eqn of 2 medians
+ solve system



$$\overline{CM} \left(\begin{matrix} 3 \\ 1 \end{matrix} \right) \quad \overline{OB} \left(\begin{matrix} 1 \\ -2 \end{matrix} \right)$$

$$m = \frac{1}{7}$$

$$y = \frac{1}{7}x + b$$

$$0 = \frac{1}{7}(-4) + b$$

$$\frac{4}{7} = b$$

$$y = \frac{1}{7}x + \frac{4}{7}$$

$$\begin{cases} y = -8x + 6 \\ y = \frac{1}{7}x + \frac{4}{7} \end{cases}$$

$$8\frac{1}{7}x = 5\frac{3}{7}$$

$$\frac{57}{7}x = \frac{38}{7}$$

$$57x = 38$$

$$x = \frac{38}{57} = \frac{2}{3}$$

$$\frac{1}{7}x + \frac{4}{7} = -8x + 6$$

$$\left(\frac{2}{3}, \frac{2}{3} \right)$$

HW
p322-323
#s 17-22, 25-27, 33, 35